[stamp] Petitioned

Unexamined Patent Application Bulletin

(19) Japan Patent Office (JP)	
(11) Unexamined Patent Application Bulletin No.	S51-90077
(43) Publication Date:	August 6, 1976
(21) Application Number:	S50-16080
(22) Date of Application:	February 6,1975
Request for Examination:	Made Total of 5 Pages
Internal Reference Numbers	7033 51
(52) Japanese Classification	72 C54
(51) Int.Cl.^{2}	B03C 3/48
[revenue stamp] ¥2,000	

Patent Application

February 6, 1975

Commissioner of Japan Patent Office:	Hideo SAITO
1. Title of the Invention:	Air sterilization and purification apparatus
2. Inventor:	Kiyoshi ANZAI
Domicile:	1070-2 Kataoka, Hiratsuka-shi, Kanagawa-ken
3. Applicant:	Director: Kiyoshi ANZAI
Domicile:	Kyowa Seiko, Ltd. 1070-2 Kataoka, Hiratsuka-shi, Kanagawa-ken
4. Agent:	Hiraki MIURA (4002) Patent Attorney [seal]
Domicile:	Marukin Building, Kagurazaka, Shinjuku-ku Tokyo 162

5. List of Appended Documents

(1) Specification	1 set
(2) Drawings	1 set
(3) Duplicate Copy of Application	1 set
(4) Power of Attorney	1 set Method Examination
(5) Request for Examination	1 set

[illegible stamp]

Specification

1. Name of the Invention: Air Sterilization and Purification Apparatus

2. Scope of Patent Claims

In an air purification apparatus that passes positively charged airborne dust between opposing electrodes, an air sterilization and purification apparatus wherein air is caused to pass through while inducing a separation phenomenon by switching the direction of flow of air that passes through the aforementioned opposing electrodes and modifying a cross section of the passage.

3. Detailed Description of the Invention

The invention of the present application is one that relates to an air sterilization and purification apparatus, and in a purification device that causes airborne dust particles to be absorbed by static electricity, relates to a device capable of raising dust removal effectiveness, and is intended to achieve an air sterilization and purification apparatus that, in particular, is made up of a combination of novel and ever simpler elements, is manufactured by a simple process with lower costs of production, and that, with excellent safety, is capable of achieving even better results in use.

Along with the development of heavy industry, air pollution from sources at each stage of the production process, nitrous oxide and sulfur dioxide emitted from transportation sources, and heavy metal particulates, have steadily increased. The widespread expansion of pollution has become an issue of serious concern to society, and various regulations have been proposed to prevent pollution, including preventing the generation of toxic materials as well as the strengthening of emissions standards. These approaches, however, cannot be considered adequate, and there are a growing number of people who suffer from lung cancer and other cancers as well as an increase in the number of people suffering from asthma. Air purifiers have become a common and indispensable part of life and are to be found installed in homes and sickrooms to prevent and/or treat these illnesses, and are used as prevention or treatment devices in the production stages of sanitary pharmaceuticals, foods, devices, and are also employed in the production of precision machinery.

A variety of devices have been suggested to cleanse the air by removing airborne toxic materials. Among those are air purifiers that use filter materials in air flow passageways to physically collect the dust, or electrical air purification devices such as dust removers that make use of static electricity or infrared rays to disinfect the air, or a combination of any of these approaches in order to remove toxic materials.

Among these, suggestions for conventional devices based on the aforementioned use of static electricity are known, including, for example, (a) an approach utilizing centrifugal force designed such that air, induced from an air inlet, passes through an ionization element while electrical voltage is applied to the inner and outer cylinders while the inner cylinder rotates, moving the air between the inner and outer cylinders, and (b) an approach where, in the above configuration, the outer circumference of an inner cylinder has inclined guide vanes provided in the axial direction along the outer circumference of the inner cylinder and rotational movement is applied to the air as it passes through between the inner and outer cylinders to make use of centrifugal force.

The above mentioned approaches have attempted combined dust collection by the use of electrostatic migration and centrifugal force, however, because high voltages with 11 KV in between the inner and outer cylinders, and as a result of rotating the induced air, a rectified electricity may be generated due to frictional resistance depending upon the air flow rate, and electric discharge sparks may occur between the dust particles that have collected onto the external cylinder, frequently causing risk of electrocution as well as the increased production of ozone and possible malfunction of the device.

In view of the above, research conducted by the inventors of the present application have overcome and eliminated the well known defects described above, and have perfected a device that is superior in terms of safety and that markedly increases the efficiency with which dust is adsorbed. The invention comprises a fan motor; an inner cylindrical electrode that has a built-in high-voltage transformer, and that is connected to the positive side; a high voltage cap connected to the negative side; an external cylindrical electrode that is earthed; and a housing that has openings on both sides, and that is supported by a pedestal. On occasion that airborne dust that is guided into the unit through the upper inlet passes through an ionization section high-voltage cap that is connected on the negative side, a positive charge is applied to the dust, and it is guided into the electrostatic field between the grounded outer cylindrical electrode and the positive inner cylindrical electrode, and as a result of the electrostatic induction effect, airborne dust passing through is adsorbed onto the surface of the outer cylindrical electrode. Thus, the present invention is characterized by having opposing electrodes that have a plurality of parallel curved surfaces and a plurality of convex curved surfaces or recessed curved surfaces on the inner cylinder and an outer cylinder provided with a plurality of parallel curved surfaces and a plurality of convex curved surfaces or recessed surfaces, wherein the convex curved surfaces or recessed surfaces of the inner cylinder and the convex surfaces or recessed surfaces of the outer cylinder alternate with each other. By creating an electrostatic field between these opposing cylinders, the direction of the flow of air passing through them can be alternated, and the flow passageway cross section can be altered so that the flow rate fluctuates, thereby creating a flow separation phenomenon. This causes the generation of a stagnant flow, a reverse flow, or a turbulent flow of air that contains dust. The intention here is to extend the duration of the effect of the electrostatic adsorption on the outer cylindrical electrode surface and to increase in the efficiency of dust removal. The next object of this invention is to provide a device with superior safety. Additionally, an object of the invention is to provide a simple and compact mechanism that can be made available at low cost and that can be placed easily in a variety of locations, as well as to provide a device that allows simple, easy, and safe cleaning of the panel upon which the dust has been adsorbed. Other objects and characteristics of the present invention can be understood. from the following explanation.

In Figs. 1 through 5, a housing acceptor cylinder (5) is supported on a stand (1) by means of a shaft (2) upon which a support board (4) consisting of insulating material and provided with exhaust windows (3); an external cylinder accepting cylinder (7) is mounted on the edge of the lower opening section of said housing; an exhaust windows (6') is arranged in the external cylinder barrel (7); and a fan motor (8) is internally installed in a motor cap (9). The fan motor (8) (for practical purposes, preferably with a maximum torque of 1040 ± 10%) is connected to a power source, and the motor cap (9) has a built-in high-voltage transformer (11) that is connected to a power source. An inner tube electrode (14) made of metal and provided with stepwise alternating vertical curved surfaces (12) and convex curved surfaces (13) is installed onto the positive side of the high-voltage transformer, and a rounded-head inner cap (16) made of insulating material and continuing the multiple outer cylinder support [illegible] (15), (15) is mounted in the top opening of this inner cylindrical electrode (14). A metallic high voltage cap (18) that is provided with a limit switch (17) is installed in this cap (16) and connected to the negative side of the high-voltage transformer and a metallic outer cylindrical electrode (22) provided with stepwise alternating vertical curved surfaces (20) and recessed curved surfaces (21) on the upper opening edge step section (19) of the outer cylinder acceptor (7). The vertical arced surfaces (20) and the recessed arced surfaces (21) are positioned so as to face the swelling arced surfaces (12) on the inner cylindrical electrode (14) and the vertical arced surfaces (12) on the inner cylindrical electrode (14) with each other, respectively. The external cylindrical electrode (22) faces the inner cylindrical electrode (14). According to FIG. 1, an air inlet window (23) is arranged in the upper opening of the external cylindrical electrode (22), and a retainer plate (25) made of insulating material is provided on the bottom limit switch retainer element (24). Next, the housing (27) is installed on the upper opening of the outer perimeter section (26) of the housing acceptor cylinder (5), which is installed on the support board (4). A head section retaining cylinder (28) is installed at the top section of this opening, and an air inlet window (29) is provided in this upper opening and a connector board (31) made of insulating material and provided with dust-proof mesh/screen (30) that is connected by means of bolts (32) to the retainer plate (25), air inlet windows (29), and air inlet windows (23), and is configured so that air passes between the inner and outer electrodes, the exhaust windows (6), and the exhaust windows (3), and is circulated to the outside when the fan motor (8) is operating.

At this time, when the high voltage transformer (11) and power source are connected by a switch, which is separately arranged (in practical terms, an input voltage of 100 V AC and output voltage of 7 KV DC are preferable) the airborne dust that is introduced [into the unit] is positively charged in the vicinity of the transformer (11), by the inner cylindrical electrode (14) that has been connected to the positive side by means of the electrostatic induction between the inner and outer electrodes, and is migrated to the external cylindrical electrodes (22) and clung to its walls.

Here, the direction of the air flow that is passing through the convex curved surfaces (12) and vertical curved surfaces (13) provided on the inner cylindrical electrode (14) is switched by the vertical curved surfaces (20) and recessed curved surfaces (21) provided on the outer cylindrical electrodes (22), and as a result of the change in the cross section layer between these electrodes, the spacing between the vertical curved surfaces (12), (20) of both electrodes should be approximately 20 mm; the spacing between the vertical curved surfaces (21) on the outer cylindrical electrodes (22) and the convex surfaces (13) on the inner cylindrical electrodes (14) should be approximately 16 mm; and the spacing between the recessed curved surfaces (21) on the outer cylindrical electrodes (22) and the vertical curved surfaces (12) on the inner cylindrical electrode (14) should be approximately 25 mm, for practical purposes. The recessed curved surfaces (21) should be 5 mm in diameter, while the convex curved surfaces (13) should be 4 mm in diameter. There is a change in flow rate, and the separation phenomenon is augmented. As a result, the dust-bearing air flow stagnates, reverses or becomes turbulent, thereby extending the duration for electrostatic adsorption and increasing dust collection efficiency (Fig. 6).

In the cross sectional configuration of the above mentioned both electrodes described above, in another embodiment, the convex curved surfaces (13) of the inner cylindrical electrodes (14) could have a gentle linear flow [illegible] convex curved surfaces (13) on the upstream side to intensify the switching of the direction of flow and the change in the flow passageway cross section, making it that much easier for the separation phenomenon to occur, forming lead (33) between the convex curved surfaces (13), (13) for a configuration that augments electrostatic induction. (Fig. 7)

Moreover, as a separate embodiment, convex curved surfaces (34) with gentle flow lines are formed on the upstream side of the outer cylindrical electrodes (22), and both flow line convex curved surfaces (34) and flow line convex curved surfaces (35) are positioned so they oppose one another, thereby intensifying the switching of the direction of flow and the change in the flow passageway cross section, extending the duration in which adsorption occurs due to stagnation, reverse flow, and turbulent flow of the dust-containing air (Fig. 8).

With regard to removal of dust clung onto the surfaces of the outer cylindrical electrodes, the power to electrode (22) is removed along with the retainer plate (25) by removing the connector board (31) and by pulling up and removing the head section retaining cylinder (28) and the housing (27), and after cleaning these, it is easy to restore them to their original state and join together. At this time, the retainer element (24) of the retainer plate (25) is separated from the limit switch

(17), thereby breaking off the flow of current between the high-voltage transformer (11) and the power source, so that there is no risk of electrocution.

As configured above, the present invention extends the duration of the cling effect on the outer cylindrical electrode by means of electrostatic induction of the dust-carrying air that passes between the electrodes, thereby increasing the efficiency of dust removal and reducing mold spores and yeast fungus.

Moreover, this is a particularly safe device since there is no danger that frictional force and resulting rectified electricity will be generated as a result of centrifugal force as the air passes through the unit, and the risk of malfunction due to sparking electric discharge between the adsorbed dust particles resulting in electrocution or explosion can be prevented, and the generation of ozone can be suppressed.

Also, given the device's simple and compact configuration, it can be manufactured less expensively, and it is also easy to move.

4. Brief Description of the Drawings

Figure 1 is a front view. Figure 2 is a plan view. Figure 3 is a view of the bottom surface. Figure 4 is a cross-sectional view along the A-A line in Figure 1. Figure 5 is a cross-sectional view along the B-B line in Figure 1. Figure 6 is an enlarged view of the area indicated by the letter E in Figure 4. Figure 7 is an enlarged flow line cross section diagram of another embodiment. Figure 8 is an enlarged flow line cross section diagram of yet another embodiment.

Applicant: Kyowa Seiko, Ltd.
Agent: Hiraki MIURA [seal]

④

特　許　願

昭和50年2月6日

特許庁長官　[illegible]　殿

1. 発明の名称　[illegible]
2. 発明者
   住所　[illegible] 107002
   氏名　[illegible]
3. 特許出願人
   住所　[illegible] 107002
   氏名　有限会社 [illegible]
   代表取締役 [illegible]
4. 代理人 〒102
   住所　[illegible]
   (6002) 弁理士 [illegible]
   電話 269-6761~3
5. 添付書類の目録
   (1) 明細書　1通
   (2) 図面　1通
   (3) 願書副本　1通
   (4) 委任状　1通
   審査請求書　1通

50 016060

⑲ 日本国特許庁

公開特許公報

⑪特開昭 51-90077
⑬公開日 昭51.(1976) 8. 6
㉑特願昭 50-16080
㉒出願日 昭50.(1975).2.6
審査請求　有　(全5頁)

庁内整理番号
7033 41

㊾日本分類	㊿Int.Cl²
72 C14	B03C 3/40

明　細　書

1、発明の名称　空気静電清浄装置

2、特許請求の範囲

高電圧を印加された導電体のふんじんを、対向する電極間を通過せしめるようにした空気清浄装置において、上記対向する電極間を通過する空気の流れ方向を変化させ、かつ流路の断面積を変化させることによって、粉塵捕集を行なわしめ空気を清浄ならしめるようにしたことを特徴とする空気静電清浄装置。

3、発明の詳細な説明

本願の発明は、空気静電清浄装置に関し、空気中のふんじんを静電気により集塵せしめる清浄装置において、その捕集効率を高めることのできる構造に関し、とくに低価で一層集塵を効率的に行ない、簡単な工程とより安い生産費で製造され、かつ安全性に優れ、より良い使用効果を得ることのできる空気静電清浄装置を提供しようとするものである。

近年工業の発展に伴い、各地の都市部において排出される大気汚染物および自動車等によって排出される窒素酸化物、いおう酸化物とくに粒子状の浮遊粉塵等の有害物質の発生はますます増大化し、それにともなって環境汚染となり社会的な問題として大きく取り上げられており、大気の汚染防止について種々の対策がなされ、有害物質の発生の予防および発生源等の排出規制がなされてきたが十分とはいえず、大気汚染による鉄、ダストその他のガス、ミスト又はじんそく（ばいじん）粒子状物質などの浮遊である。空気清浄装置は、上記目的のために工場又は家庭内で使用し或いは病室に設置し、予防、治療用として或いは又精密工業用、食品、医薬品の生産工程においてさらに又、各種機器の試験研究所において使用し、衛生上不可欠の装置となった。

そこで、空気中の有害物質を除去して清浄化のための装置が種々実施され、そのいくつかは空気の通過路において例えば、濾過材を用い機械的に捕集するものおよび静電気作用により集塵せしめるもの又は吸着剤を用い吸着効果を利用する化学的に清浄化する装置その他上記各種方式の

BEST AVAILABLE COPY

合せ組合によつて有害物質を除去せんとする提案がされている。

又而、静電気集塵機を利用に基く従来の装置には、例えば、(1)、空気入口から導入された空気が集塵部を通つて、高電圧に電圧を印加された針状の周囲を、円筒の周りを旋回しながら通過するようにした遠心力を利用する装置、(2)、上記の装置において、円筒の外周部に沿つて接線方向に対し傾斜した電極を備え、空気がこの円筒外周部の周辺を通過する際に回転運動を与えられるようにした遠心力を利用する装置等が知られている。

上記の装置は、静電気の吸引力と遠心力との相乗効果作用を持つたものであるが、装置内外周間に11KVの高電圧を印加し、導入空気を通過させる結果、空気の放電によつては異常放電によつて有毒ガスを生じ、外周に吸着されたふんじん等の層に火花放電を生じ、しばしば発火のおそれがあり、又オゾンの発生量を増大しオゾン臭を人体衛生上好ましくなく、又しばしば故障を生ずる等の欠点を免れなかつたので実用化が困難であつた。

上記に鑑み、本発明の特徴は従来の欠点上記欠点の放電による火花を完全解消し、さらに遠心力に優れ、ふんじんの除去効率を一層高めることのできる構造を発明したもので、ファンモートル、高圧トランスを内蔵しその側に接続した円筒状電極の側に近接した高圧キャップ、形成した外口電極および両端に開口部をもつ容器に支えられたハウジングから構成され、上方入口から導入される空気中のふんじんが、その間に印加された高圧キャップの電極部を通過する際、正の電荷を与えられ、形成された外筒電極と正の側に接続された円筒電極側の静電界に吸引され、~~[illegible]~~によつて通過する空気中のふんじんを外筒電極側に吸着せしめる作用を有するもので、したがつて本発明の特徴により、新規する装置は、数個の平行波面と数個の凹凸波面又は凹凸波面を具える内筒と、および数個の平行波面と数個の凹凸波面又は凹凸波面を具える外筒とを、その内側の凹凸波面又は凹凸波面と、外筒の凹凸波面又は凹凸波面とを交互

にして、両者を対向させた静電部を構成することによつて、通過する空気の流れ方向の急角度および風路断面積の変化による風速を利用させ、流れの乱流を生ぜしめ、これによつて空気流の流れの方向、速度或いは乱流を発生させ、静電部の静電気吸着作用の効果を高め、製造も容易にすることができるものであり、本発明の第一の目的は、空気浄化に優れた装置を提供することであり、さらに本発明の第二の目的は、構造が簡単で小型化され、安価に提供することであり、又、装置の各部に合成樹脂を用い、ふんじんの吸着されたフィルターの洗浄作業が簡単に出来るので衛生的であることである。本発明のその他の目的および特徴は次の説明によつて明らかとなるであろう。

以下に添付図面につき本発明の構成を詳しく説明する。

第1〜4図において、合成樹脂により一体成形して形成される円筒状外筒を具えたハウジングからなる空気清浄機に、ハウジング支持脚を形成し、更にハウ

ジング円筒の下方部の底面部に、円筒体(c')を設けた通風口部を有した外筒支持部を載せ、その上方部にファンモートル(8)を内蔵した略逆皿状からなるモートルキャップ(9)を形成し、ファンモートル(8)（実用的には耐久トルク2960土10ダイン以上のもの）を取付口に固着することおよび、該モートルキャップ(9)上段部材に支承に取付した高圧トランス(33)を内蔵し、同様に平板電極(38)と凹凸波面(35)とを放射的に交互に設けた合成の内筒電極(34)を高圧トランスの正の出力側に接続して嵌着し、該内筒電極(34)の上方開口部に、所要形状とした複数の外筒支え具(16),(16)を配設した略円盤形からなる円筒キャップ(26)を配置して、該キャップ(26)にリベット、ヘアピン等(37)を付属した金属の高圧キャップ(38)を嵌着し、高圧トランスの負の側に接続することおよび、前記外筒支持体の上端開口内側(29)に、その内周部に平板波面(30)と凹凸波面(31)とを放射的に交互に設けた合成の外筒電極(30)を嵌着して、その平板波面(30)が内筒電極(34)の凹凸波面(35)とおよびその凹凸波面

(22)は内口支え(24)の金属ば筒(23)と互いに対向するように位置させて、[illegible](24)と対向させて構成した上、その上方開口部に吸気孔(25)を具え、下側にリミットスイッチの押え部材(26)を付設する耐熱合成樹脂からなる押え板(25)を形成し、[illegible]ヘッダング[illegible]の上方開口部[illegible](28)にパッキング(27)で[illegible]し、その上方開口部に[illegible]押え口(28)を形成した上、その上方開口部に[illegible](30)を設け[illegible](29)を[illegible]した[illegible]からなる[illegible](31)を[illegible]し、ボールト(32)を介して押え板(25)と[illegible]し、[illegible]、ファンネートル[illegible]の[illegible]、空気は[illegible](13)および押え板(25)の[illegible](13)より、内、外両電極間を通過し、排気口(0)、[illegible]で外部に排出する構成とする。

その他、[illegible]トランス(33)（具体的には、入力電圧AC100V、出力電圧[illegible]）と電源とを外部に設けたスイッチによりON-OFFすれば、挿入される[illegible]のふとんを

は、[illegible]ファンプ(11)の[illegible]において[illegible]の[illegible]、内外両電極間において[illegible]により[illegible]した内筒電極(14)に[illegible]され、外[illegible](22)に[illegible]されその[illegible]に[illegible]される。

この場合、内筒電極(14)に設けた[illegible](13)と[illegible]など、外筒電極(22)に設けた[illegible](20)と[illegible](21)とによって、空気の通過する[illegible]の[illegible]され[illegible]つ、その[illegible]の[illegible]（[illegible]内筒電極の[illegible](13)、(20)の[illegible]は約3〜5mm、外筒電極(22)の[illegible](22)と内筒電極(14)の[illegible](13)との[illegible]は約3〜5mm、[illegible](20)の[illegible](21)と内筒電極(14)の[illegible](13)との間隔を約2〜3mmとすると、[illegible](13)は2〜3mm、[illegible](13)は4〜5mmとすることが望ましい。10kVによって放電が発生し、[illegible]を[illegible]することとなり、これによって[illegible]の[illegible]、[illegible]を[illegible]させ[illegible]の[illegible]作用時間の延長が[illegible]られ[illegible]を[illegible]しめる構成となる。（第6図）

上記実施例の構成において、他の実施例として、内筒電極(14)の[illegible](13)の上部[illegible](13)として[illegible]の[illegible]を[illegible]し、[illegible]することもできる。さらに、[illegible](13)、(13)に[illegible](33)を[illegible]して[illegible]を[illegible]する構成とすることもできる。（第7図）

さらに又、別の実施例として、外筒電極(22)に一部[illegible]において[illegible](34)を設け、外筒電極に[illegible]において[illegible](35)を設け、[illegible](34)、(35)を[illegible]に[illegible]として[illegible]させ、[illegible]の[illegible]、[illegible]の[illegible]を[illegible]させ、[illegible]の[illegible]、[illegible]、[illegible]に[illegible]作用時間を[illegible]することもできる。（第8図）

次に、外筒電極[illegible]されたふとんの[illegible]については、[illegible](31)を[illegible]し、[illegible](28)および[illegible]パッキング(27)を引上げて取り外した上、押え板(25)とともに外筒電極(22)を引き[illegible]、[illegible]に[illegible]して[illegible]することができ

[illegible]である。この押え板(25)の押え部材(26)がリミットスイッチ(29)と接触し、[illegible]トランス(33)と電源との接続を[illegible]って、[illegible]。

本発明の効果は、上記の構成によるので、[illegible]を通過する空気が[illegible]によって[illegible]を[illegible]するので、その[illegible]を[illegible]することができる。

又、通過中の空気は、放電によって[illegible]によるオゾン[illegible]の[illegible]、よってふとんとの[illegible]に[illegible]する[illegible]の[illegible]を[illegible]することができ、[illegible]の[illegible]をすることもできる[illegible]である。

さらに[illegible]であるので[illegible]より安い[illegible]である。

4、図面の簡単な説明

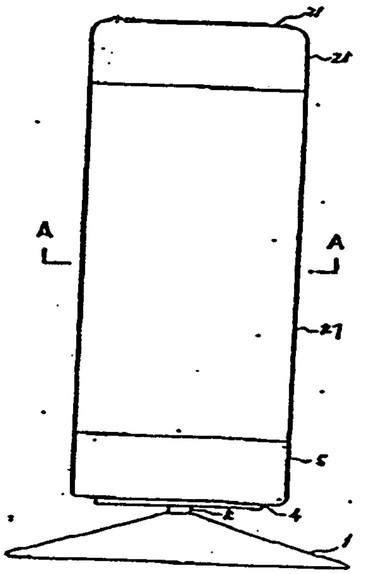
第1図は正面図、第2図は平面図、第3図は[illegible]

BEST AVAILABLE COPY

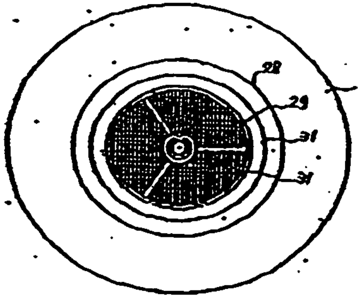
面図、第4図は第1図A－A線における縦断面図、第5図は同B－B線における横断面図、第6図は第6図(e部)における拡大断面説明図、第7図は他の実施例における同拡大断面説明図、第8図は吸気口に対の天井部における同拡大断面説明図である。

出願人　[illegible]
代理人　三　浦　[illegible]

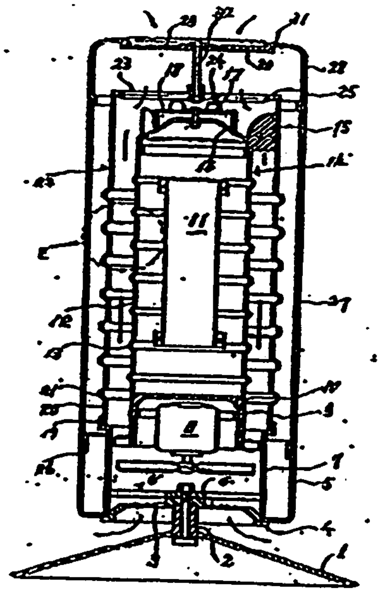
第１図



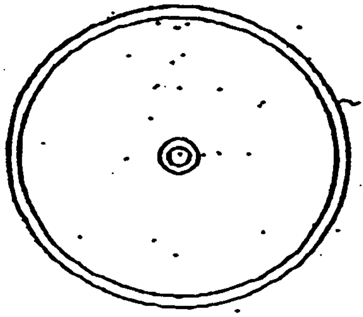
第２図



第４図



第３図



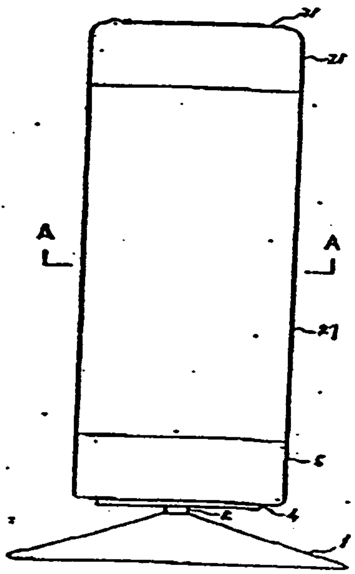
BEST AVAILABLE COPY

面図、第4図は第1図A−A線における縦断面図、第5図は第4図B−B線における横断面図、第6図は第4（C部）における拡大断面図、第7図は他の実施例における同拡大断面図、第8図は更に別の実施例における同拡大断面図である。

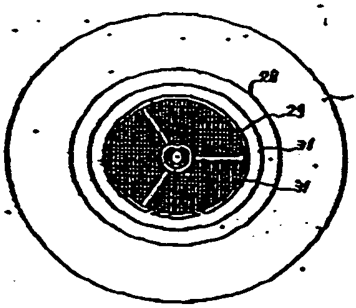
出願人　有限会社　[illegible]精工
代理人　三[illegible]

特開 昭51−90077 (6)

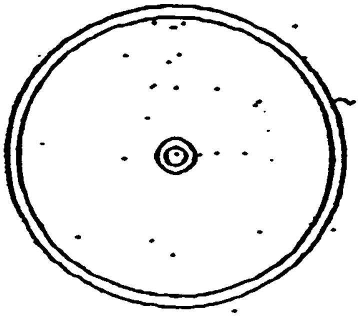
第 1 図



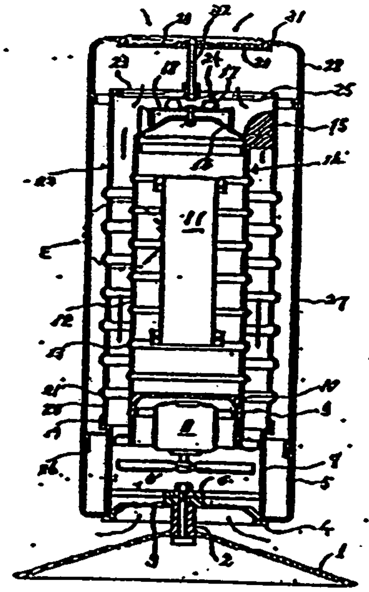
第 2 図



第 3 図

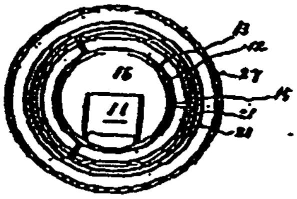


第 4 図

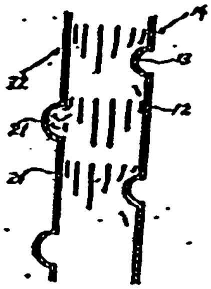


BEST AVAILABLE COPY

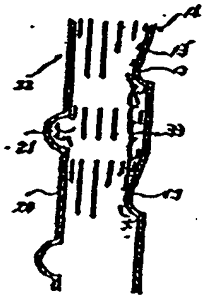
第 5 図



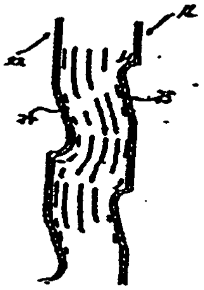
第 6 図



第 7 図



第 8 図



BEST AVAILABLE COPY

THIS PAGE BLANK (USPT